Patent claims

1. A heat exchanger, in particular for a supercritical refrigeration cycle, having a block comprising tubes and fins, it being possible for a gaseous medium, in particular air, to flow over the fins, and it being possible for a second medium, in particular a refrigerant, to flow through the tubes, which are arranged in a plurality of rows, in particular in cross-countercurrent to the gaseous medium, characterized in that at least four rows of tubes (1.1, 1.2, 1.3, 1.4) are arranged in series in the direction of flow L of the gaseous medium.

2. The heat exchanger as claimed in claim 1, characterized in that at least five rows of tubes (2.1, 2.2, 2.3, 2.4, 2.5) are arranged in series.

3. The heat exchanger as claimed in claim 1 or 2, characterized in that six rows of tubes (3.1, 3.2, 3.3, 3.4, 3.5, 3.6) are arranged in series.

4. The heat exchanger as claimed in one of claims 1 to 3, characterized in that the tubes are formed as flat tubes (9) and the fins are formed as corrugated fins (10, 12, 13, 15).

5. The heat exchanger as claimed in claim 4, characterized in that the flat tubes (9) are formed as extruded multichamber tubes.

6. The heat exchanger as claimed in one of claims 1 to 5, characterized in that medium can flow through the tubes R of a row of tubes (1.1, 1.2, 1.3, 1.4) in parallel.

7. The heat exchanger as claimed in claim 6, characterized in that medium can flow through the rows of tubes (1.1 to 1.4; 2.1 to 2.5; 3.1 to 3.6) in series.

8. The heat exchanger as claimed in one of claims 1 to 5, characterized in that at least one row of tubes (4.3, 4.4) is divided into tube segments (3a, 3b, 4a, 4b) with individual tubes through which medium can flow in succession.

9. The heat exchanger as claimed in claim 8, characterized in that the rows of tubes (4.3, 4.4) which are divided into tube segments (3a, 3b, 4a, 4b) are arranged upstream of the undivided rows of tubes (4.1, 4.2), as seen in the direction of flow L of the gaseous medium.

10. The heat exchanger as claimed in claim 8, characterized in that all the rows of tubes (6.1 to 6.4; 7.1 to 7.4) are divided into tube segments (1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b) through which medium can flow in series.

11. The heat exchanger as claimed in claim 10, characterized in that the tube segments (1a to 4b) have different numbers of tubes.

12. The heat exchanger as claimed in claim 10, characterized in that the tube segments (1a to 4b) have approximately equal numbers of tubes.

13. The heat exchanger as claimed in claim 10, characterized in that the ratio a/b of the numbers a, b of the tubes of two tube segments (1a, 1b; 2a, 2b) in a row of tubes (6.1; 6.2) is in a range from 0.7 to 1.35.

14. The heat exchanger as claimed in one of claims 8 to 13, characterized in that the tube segments (1a, 1b; 2a, 2b; 3a, 3b; 4a, 4b) are connected by header tubes and are separated by partition walls in the header tubes.

15. The heat exchanger as claimed in one of claims 1 to 14, characterized in that adjacent rows of tubes are connected to one another by diverter members (V).

16. The heat exchanger as claimed in one of claims 4 to 15, characterized in that the corrugated fins (10) of the individual rows of tubes (8.1 to 8.4) are thermally decoupled.

17. The heat exchanger as claimed in claim 4 to 15, characterized in that in each case two rows of tubes (11.1, 11.2; 11.3, 11.4) have common, continuous corrugated fins (12, 13).

18. The heat exchanger as claimed in claim 4 to 15, characterized in that all the rows of tubes (14.1 to 14.4) have common, continuous corrugated fins (15).

19. The heat exchanger as claimed in one of claims 4 to 18, characterized in that the flat tubes (9) of different rows of tubes (11.1 to 11.4) are arranged aligned with one another.

20. The heat exchanger as claimed in one of claims 4 to 18, characterized in that the flat tubes (9) of different rows of tubes (16.1 to 16.4) are arranged offset with respect to one another.

21. The heat exchanger as claimed in one of claims 4 to 20, characterized in that the transverse pitch t_R of the flat tubes (9) is identical in all the rows of tubes (16.1 to 16.4).

22. The heat exchanger as claimed in claim 4 to 20, characterized in that the transverse pitch t_R of adjacent rows of tubes varies.

23. The heat exchanger as claimed in one of the preceding claims, characterized in that the block has a finned end face with a height H and a width B, and in that the ratio of B/H is in the range from 0.8 to 1.2.

24. The heat exchanger as claimed in claim 23, characterized in that the end face is approximately square in form.

25. The heat exchanger as claimed in claim 23 or 24, characterized in that the end face has a surface area A in a range from 4 dm^2 to 16 dm^2.

26. The use of the heat exchanger as claimed in one of the preceding claims as a gas cooler in a supercritical refrigeration cycle of a motor vehicle air-conditioning system, which is preferably operated with R744 (CO_2).